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SUBJECT: KAZAKHSTAN: THE NUCLEAR INDUSTRY

REF: A. Almaty 6

[B.](#) Almaty 602

[C.](#) Moscow 932

[¶](#)1. (SBU) Summary: The nuclear fuel cycle in Kazakhstan is wholly managed by the state-owned Kazatomprom company, and dominated by uranium mining and milling operations. Kazatomprom is investing heavily in increasing uranium production not only to profit from the projected increase in world demand, but also with the vision of using its stockpiles as leverage to buy into enrichment facilities in other countries that it currently lacks.

Kazatomprom is de facto completing the fuel cycle through vertical integration with international partners, rather than on Kazakhstani soil. End summary.

Kazakhstan and the Uranium Fuel Cycle

[¶](#)2. (SBU) The uranium fuel cycle consists of a series of steps, which differ according to the finished product. The first variant: 1. Raw uranium extraction in the form of mining and milling; 2. Processing the raw uranium into U3O8 (yellowcake); 3. Fuel fabrication of the yellowcake into low-grade uranium dioxide (UO₂) pellets; 4. Waste disposal or reprocessing of the depleted uranium. The second variant: 1. Raw uranium extraction in the form of mining and milling; 2. Processing the raw uranium into U3O8 (yellowcake); 3. Conversion of the yellowcake into uranium hexafluoride (UF₆) for enrichment; 4. Enrichment of the UF₆ to bring out higher concentrations of the U235 isotope; 5. Fuel fabrication of the UF₆ into high-grade UO₂ pellets; 6. Waste disposal or reprocessing of the depleted uranium.

[¶](#)3. (SBU) When part of the former Soviet Union, Kazakhstan was an integral part of the USSR's fuel cycle, serving as its hub for uranium mining, nuclear testing and waste disposal, as well as limited enrichment activities. Today Kazakhstan lacks only the enrichment capability, although it does not sell or have markets for many of the steps in the fuel cycle described above. The Kazakhstani fuel cycle, instead, is heavily concentrated on uranium extraction and both high- and low-grade UO₂ fuel fabrication activities.

[¶](#)4. (SBU) In the short run, Kazatomprom's focus is on becoming a leading world exporter of uranium by 2010. Kazatomprom has made it clear that in the long run, it intends to gain some measure of control over all steps in the nuclear fuel cycle. It is pursuing this goal by participating in various joint ventures with international firms, in exchange for access to technology or existing export markets.

Mining, Milling and Processing

15. (SBU) Kazakhstan possesses an estimated 15–30% of the world's uranium reserves, and the Kazakhstani government has repeatedly expressed its desire for Kazakhstan to increase its share of the world market. Kazakhstan increased uranium production by 30% from 2004 to 2005, to 4,300 tons. In June, Kazatomprom president Mukhtar Dzhakishev announced that Kazakhstan was on track to produce 17,500 tons of uranium per year by 2010, which would make it the top producer in the world. Production would rise to 25,000 tons per year by 2050. (Comment: Dzhakishev may have later realized that he overreached; the Kazatomprom.kz web site now prominently features a section entitled "15,000 tons by 2010.")

16. (SBU) Kazakhstan's uranium mining industry has evolved from the conventional, Soviet extraction industries in Stepnogorsk and Aktau, to numerous in-situ leaching (ISL) operations in Southern Kazakhstan oblast. The shift to ISL has allowed Kazakhstan to economically exploit a wider range of uranium deposits at a lower environmental cost, with less waste and improved safety.

17. (SBU) Beginning in 1997, the state-owned firm Kazatomprom gained ownership of all uranium exploration, production, processing and marketing activities formerly held by the Kazakhstan State Corporation for Atomic Power and Industry (KATEP). Kazatomprom today owns all mineral resources, requires producers to have licenses, and is the monopoly importer and exporter of uranium in Kazakhstan. All uranium mining in Kazakhstan is controlled by Kazatomprom in the form of three domestically-owned mining directorates and three joint mining ventures.

Mining Directorates:

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-- The Stepnoye Mining Group, located in Stepnoye, Suzak District, Shymkent Oblast with an estimated 750,000 tons of reserves.

-- The Taukentski (formerly Tsentralnoye) Mining and Chemical Combine in Taukent, Suzak District, Shymkent Oblast with an estimated 140,000 tons of reserves.

-- Mining Group #6 located, in Chiili, Kzyl-Orda Oblast.

Joint Ventures:

-- Inkai, owned by the Canadian Cameco (60%) and Kazatomprom (40%) and located in Stepnoye, Shymkent Oblast. Reserves estimated at 57,000 tons. Commercial production is estimated at 400 tons in 2006, ramping up to 2,600 tons annually by 2010.

-- Katco, owned by the French AREVA (51%) and Kazatomprom (49%) and located in Tsentralnoye, Shymkent Oblast. KATCO completed construction of the first processing plant at the end of 2005. Construction of a second plant will begin in spring 2006. Total annual production is anticipated to be 1,500 tons.

-- Zarechnoye, owned by the Russian TENEX (49.33%), Kazatomprom (49.33%), the Russian Atomredmetzoloto (0.67%), and the Kyrgyz Kara-Baltinskin Mining Combine (0.67%).

18. (SBU) Once mined, the raw uranium is then processed and packaged into yellowcake at either the Kara Balta Ore Mining Combine in Kyrgyzstan or by KazSabton in Stepnogorsk, formerly known as the Stepnogorsk Mining and Chemical Complex. Kazatomprom owns shares in both complexes and thus manages the sale of yellowcake on the international market to Nukem of Germany, Cameco of Canada, Energy Resources of Australia, various Russian enrichment facilities and undisclosed Chinese companies. The remaining yellowcake is transferred to the Ulba Metallurgical plant in Ust-Kamenogorsk for conversion and/or fuel fabrication.

Conversion and Fuel Fabrication

¶9. (SBU) After the uranium ore is processed into yellowcake, it can be converted into UF6 gas for commercial enrichment or directly into low-grade UO2 fuel pellets for certain reactors not requiring enriched fuel, such as the CANDU line marketed by Atomic Energy of Canada. Otherwise, after the UF6 has been enriched, it can be converted into a high-grade form of UO2 for use in many different types of reactors. There is no domestic market at present for the fuel Ulba produces, as Kazakhstan's four research reactors (see para. 21) use HEU.

¶10. (SBU) It is not clear whether the Ulba plant is engaged in the pre-enrichment fabrication of UF6 itself. However, the technical literature suggests that Ulba does produce UF6 as an intermediate step involved in uranium recuperation, although it does not sell it. Kazatomprom is involved in several joint ventures with companies that process yellowcake into UF6, including Russia's Rosatom conversion sites in Yekaterinburg and Angarsk; Canada's Cameco site in Port Hope, Ontario; and Germany's Nukem site in Alzenau, Germany.

¶11. (SBU) The Ulba plant's principal output is an extensive range of UO2 powders containing between 1-5% of the U235 isotope, which occurs naturally in quantities of approximately 0.7%. The Ulba plant's technology allows UO2 to be produced from any feed containing uranium, including unenriched or enriched UF6, raw yellowcake, uranium oxides and fluorides, fuel process wastes, reprocessed feed material, scraps from research laboratories, crucibles and so on.

¶12. (SBU) Currently, the Ulba plant receives raw yellowcake from domestic mines, enriched UF6 from the Russian Angarsk Electrolytic Chemical Combine and the Electrochemical Plant in Zelenogorsk, and various other forms of uranium feed stock from undisclosed locations. The incoming feedstock is then processed into differing grades of UO2 for fabrication of fuel pellets. The Ulba plant exports the fuel pellets to the U.S., Canada, France, and South Korea, as well as to advanced fabrication facilities in Moscow (Elektrostal) and Novosibirsk, where they are made into fuel rods and assemblies. In a May address to nuclear engineering students, Kazatomprom president Dzhakishev stated that Kazatomprom wanted to expand into the production of nuclear fuel assemblies. He also said that the firm was developing a new uranium conversion process.

Enrichment and Reprocessing

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¶13. (SBU) Currently, there are no enrichment facilities in Kazakhstan, although the Ulba Metallurgical Plant produced military grade, highly enriched uranium (HEU) fuel until the mid-1980's. Kazakhstani government officials insist that there are no plans to engage in enrichment on the territory of Kazakhstan.

¶14. (SBU) Likewise, Kazakhstan does not conduct formal reprocessing activities, though the chain of activities at the Ulba plant does include the separation of all types of uranium concentrates. This same technology gives the Ulba Plant the capability to downblend HEU into low-enriched uranium (LEU) by separating the U235 isotope. Ulba is currently downblending 2900 kg of fresh fuel from BN-350 that was transferred there in 2001 with support from Ted Turner's Nuclear Threat Initiative.

Power Production

¶15. (SBU) Before decommissioning in 1999, the 1000Mwt BN-350 Liquid Metal Fast Breeder Reactor in Aktau was Kazakhstan's sole nuclear power reactor, producing power, district heating, and plutonium for the Soviet nuclear program over its 27 year lifespan. The Department of Energy has been working with Mangyshlak Atomic Energy Complex (MAEC), which owns BN-350, since 1996 to upgrade materials protections and controls (1996-1998)

and to package the spent fuel (1996-2001). The next phase of the project is to move the spent fuel to a safe long-term storage facility at the Baykal-1 site in Kurchatov and to safely dispose of the sodium coolant. Kazakhstan presently has no functioning nuclear power plant.

¶16. (SBU) Kazakhstan has long flirted with plans to expand its nuclear power infrastructure. As reported Ref B, in January Prime Minister Daniyal Akhmetov instructed the Ministry of Energy and Mineral Resources to convene a working group to evaluate the construction of nuclear power plants by 2015. The working group announced in July that it had identified four regions as potential sites for nuclear power plants: Almaty Oblast in southeastern Kazakhstan, Mangistau Oblast in western Kazakhstan, Akmola Oblast (central Kazakhstan surrounding Astana), and Eastern Kazakhstan Oblast. The group also announced that it had drafted technical specifications for the proposed power plants, but did not reveal any details.

¶17. (U) In a January 2006 interview published on the Nuclear.Ru web site, Kazatomprom president Dzhakishev commented that the decision to build nuclear power plants should be determined by economic necessity. Dzhakishev argued that as Kazakhstan currently produces enough electricity for its own needs, there is no economic reason at present to construct nuclear power plants.

Nuclear Waste and Spent Fuel

¶18. (SBU) Kazakhstan inherited some 230 million tons of radioactive waste from the Soviet Union and continues to produce small amounts related to the uranium mining and processing activities. The waste is stored in 529 different locations, including 127 sites at uranium mining and processing facilities; 76 at ore milling and processing facilities; 16 at former nuclear test sites; five at nuclear facilities; and 301 at plants using sealed radiation source products. Spent fuel is currently stored at the Baykal-1 reactor complex at the National Nuclear Center in Kurchatov.

¶19. (SBU) In June 2001, Kazatomprom president Dzhakishev presented a proposal to parliament to turn Kazakhstan into a commercial importer of radioactive waste. A group of parliamentary deputies, joined by NGOs and environmental activists, quickly mounted a public campaign against the proposal, citing Kazakhstan's lack of administrative structure and rampant corruption as grounds for its dismissal. By 2003, their efforts resulted in the proposal stalling in Parliament.

¶20. (SBU) Nevertheless, some scientists, officials and nuclear industry representatives still support the proposal in the belief that it would allow the country to profit from solving its own nuclear waste problem. They argue that the imported quantities of radioactive waste would equal only 1% of Kazakhstan's current stockpile, while generating some \$30-40 million in profits. They advocate importing low and medium level radioactive wastes, as defined by the IAEA, which would not include spent fuel containing plutonium. Others, however, argue that because not all countries adhere to the IAEA's classification system, low and

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medium level wastes could contain plutonium, thus increasing proliferation and contamination risks. In June, new National Nuclear Center head Kairat Kadyrhanov stated publicly that the debate over nuclear waste storage had caused "too much commotion." He expressed confidence that Kazakhstan could develop ways to store waste, including its own, with no risk to the environment.

Research and Development

¶21. (SBU) Three organizations manage the Kazakhstani government's nuclear research and development activities: the Institute of

Atomic Energy (IAE), the Institute of Nuclear Physics (INP), and the Nuclear Technology Safety Center (NTSC). The IAE and the INP are both part of the National Nuclear Center (NNC), established on the former Semipalatinsk nuclear test site at Kurchatov in 1992. The NNC owns several small cyclotrons and particle accelerators. The NNC also owns the four research reactors in Kazakhstan, which include three tank-type units of 6, 10 and 60 MW at Kurchatov and one 400kW high-temperature gas reactor outside of Almaty in Alatau. All of the research reactors are operated by the IAE and use imported Russian HEU fuel.

¶22. (SBU) In August 2005, the GOK passed Resolution 832 creating the "Nuclear Technologies Park" joint stock company to be constructed on the NNC site in Kurchatov. The Resolution allocated 273 million tenge (\$2.3 million) for the initial implementation plan. Construction is expected to conclude in 2020 and will involve nuclear physics installations and industrial facilities.

¶23. (SBU) The Institute of Higher Technologies is a research institute owned by Kazatomprom (50%), Ulba (47.5%), and Volkovgeologiya (2.5%). It recently established three new laboratories dealing with technology used at Ulba (fluorine and electrochemistry, tantalum and beryllium, and nuclear materials and reactors). Some observers believe the labs were created to preserve Ulba's knowledge base in the event that more of Ulba's ethnic Russian experts leave. Kazatomprom also runs the Kazakhstani Nuclear University, which offers courses in uranium production and ISL processing and plans to expand its offerings to courses on nuclear fuel production and power industry development.

The Future of the Uranium Fuel Cycle

¶24. (SBU) Kazatomprom president Dzhakishev announced on May 15 that Kazatomprom has no plans for an IPO and will remain a state-owned enterprise for the foreseeable future. Kazatomprom has recently allowed several foreign companies to buy large shares in a number of Southern Kazakhstan mining operations. In January, Kazatomprom entered into a strategic partnership agreement with two Japanese corporations, Sumitomo Corporation and Kansai Electric Power Corporation. The agreement provides for the creation of a tripartite joint venture for development of the uranium deposit in southern Kazakhstan (Ref B).

¶25. (SBU) In January 2006, Kazakhstan and Russia announced their intention to integrate their nuclear industries. Later that month, the head of Russia's Rosatom commented on the advisability of restoring the former Soviet Union's nuclear technological complex that existed under the Ministry of Medium Machine Building (Minsredmash) (Ref C). The first meeting of the Russian-Kazakhstani working group for nuclear power cooperation took place this March in Moscow.

¶26. (SBU) In his January interview with Nuclear.Ru, Kazatomprom president Dzhakishev stated that the firm's task "over the next three decades is to create a vertically integrated company with the complete fuel cycle . through alliances, its own production, and other options." Dzhakishev in May announced his company's plans to buy shares of Russian and French enrichment companies in exchange for access to Ulba's production facilities. He noted that negotiations are set to wrap up in 2006-2007.

¶27. (SBU) Comment: Taken together, Kazatomprom's actions point strongly to a desire to ultimately control the entire fuel cycle through international cooperation, using its vast domestic uranium reserves as economic leverage. Future cooperation will likely rely heavily on further integration with the Russian nuclear industry, though Kazatomprom has made efforts to diversify its engagements, which include numerous Canadian, Japanese, American, German, Chinese and South Korean joint

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